Claims Listing

1. (previously presented) A method of testing an optoelectronic device including a VCSEL, said VCSEL having a cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, comprising the steps of:

at an intermediate stage of its assembly, measuring an optical signal leaking through said backside reflector of said VCSEL,

determining from the measured signal whether a selected quality of said VCSEL meets a predetermined specification, and then

finishing said device in a configuration designed to use radiation emitted from said frontside reflector of said VCSEL.

2. (previously presented) The invention of claim 1 wherein said measuring step includes aligning a probe with said device and then measuring radiation leaking from backside reflectors of a multiplicity of VCSELs without performing another act of aligning said probe.

3. (previously presented) A method of testing a bottom-emitting VCSEL array at an intermediate stage of its manufacture, the VCSEL array including VCSELs each having a cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, comprising the steps of:

aligning a probe with one side of said VCSEL array, said probe including electronic circuits coupled to each of said VCSELs for causing said VCSELs to emit radiation and including photodetection circuits coupled to each of said VCSELs for detecting radiation leaking through each of said backside reflectors,

without performing another act of aligning said probe, determining from said detected backside radiation whether a selected quality of each VCSEL meets a predetermined specification, and then

for those VCSEL arrays that meet specification, finishing their manufacture in a configuration designed to use radiation emitted from said frontside reflectors.

4. (previously presented) The invention of claim 3 wherein said intermediate stage

includes fabricating said VCSEL array on a substrate and said aligning and determining steps are performed without removing said substrate.

5. (previously presented) The invention of claim 4 wherein said finishing step includes removing said substrate before final assembly.

6. (currently amended) A method of testing a bottom-emitting VCSEL array at an intermediate stage of its manufacture, the VCSEL array including VCSELs each having a cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, comprising the steps of:

aligning a probe with said VCSEL array, said probe including a first array of electronic circuits coupled to one side of said VCSEL array and to each of said VCSELs for causing said VCSELs to emit radiation and including a second array of photodetection circuits, including photodetectors coupled to an opposite side of said VCSEL array and to each of said VCSELs for detecting radiation ~~leaking~~ emitted through each of said ~~backside~~ frontside reflectors,

without performing another act of aligning said probe, determining from said detected ~~backside~~ frontside radiation whether a selected quality of each VCSEL meets a predetermined specification, said determining step including energizing said electronic and photodetection circuits in a fashion to reduce cross-talk between VCSELs and each photodetector, and then

for those VCSEL arrays that meet specification, finishing their manufacture in a configuration designed to use radiation emitted from said frontside reflectors.

7. (previously presented) The invention of claim 6 wherein said VCSELs are energized in a first predetermined sequence and said photodetection circuitry is energized in a second predetermined sequence so as to reduce cross-talk.

8. (previously presented) The invention of claim 7 wherein all of said VCSELs are energized concurrently, but said photodetection circuits are energized in a sequence that reduces said cross-talk.

9. (previously presented) The invention of claim 8 wherein said photodetection circuits

are energized in a sequence that turns on a particular one of said circuits while concurrently turning off circuits adjacent thereto.

10. (previously presented) The invention of claim 7 wherein all of said photodetection circuits are energized concurrently, but said VCSELs are energized in a sequence that reduces said cross-talk.

11. (previously presented) The invention of claim 10 wherein said VCSELs are energized in a sequence that turns on a particular one of said VCSELs while concurrently turning off VCSELs adjacent thereto.

12. (previously presented) The invention of claim 7 wherein first groups of said VCSELs are energized in said first sequence and second groups of said circuitry are energized in said second sequence, with VCSELs in each of said first groups being energized concurrently with one another and circuits in each of said second groups being energized concurrently with one another.

13. (previously presented) The invention of claim 6 wherein said intermediate stage includes fabricating said VCSEL array on a substrate and said aligning and determining steps are performed without removing said substrate.

14. (previously presented) The invention of claim 13 wherein said finishing step includes removing said substrate before final assembly.

15. (previously presented) Apparatus for testing an optoelectronic device at an intermediate stage of its manufacture, said device including a VCSEL having a cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, said apparatus comprising:

a probe including a photodetection circuitry for measuring an optical signal leaking through said backside reflector of said VCSEL, and

means for determining from the measured signal whether a selected quality of said

VCSEL meets a predetermined specification.

16. (previously presented) The invention of claim 15 further including means for aligning said probe with said device just once and wherein said photodetection circuitry measures radiation leaking from backside reflectors of a multiplicity of said VCSELs.

17. (previously presented) Apparatus for testing a bottom-emitting VCSEL array at an intermediate stage of its manufacture, the VCSEL array including VCSELs formed on a substrate, each VCSEL having a cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, said apparatus comprising:

a probe including electronic circuits coupled to each of said VCSELs for causing said VCSELs to emit radiation and including photodetection circuits coupled to each of said VCSELs for detecting radiation leaking through each of said backside reflectors,

means for aligning said probe just once with one side of said VCSEL array, and

means for determining from said detected backside radiation whether a selected quality of each VCSEL meets a predetermined specification.

18. (previously presented) The invention of claim 17 wherein said aligning means and determining means function without removing said substrate.

19. (previously presented) Apparatus for testing a bottom-emitting VCSEL array at an intermediate stage of its manufacture when its substrate is intact, the VCSEL array including VCSELs each having a cavity resonator formed by a relatively low reflectivity frontside reflector and a relatively higher reflectivity backside reflector, said apparatus comprising:

a probe including a first array of electronic circuits coupled to one side of said VCSEL array and to each of said VCSELs for causing selected ones of said VCSELs to emit radiation and including a second array of photodetection circuits, including photodetectors coupled to an opposite side of said VCSEL array and to each of said VCSELs for detecting radiation ~~leaking~~ emitted through each of said ~~backside~~ frontside reflectors,

means for aligning said probe just once with said VCSEL array, and

means for determining from said detected ~~backside~~ frontside radiation whether a selected

quality of each VCSEL meets a predetermined specification, said determining means including means for energizing said electronic and photodetection circuits in a fashion to reduce cross-talk between VCSELs and each photodetector.

20. (previously presented) The invention of claim 19 wherein said probe energizes said VCSELs in a first predetermined sequence and said photodetection circuitry in a second predetermined sequence so as to reduce cross-talk.

21. (previously presented) The invention of claim 20 wherein said probe energizes all of said VCSELs concurrently, but energizes said photodetection circuits in a sequence that reduces said cross-talk.

22. (previously presented) The invention of claim 21 wherein said probe energizes said photodetection circuits in a sequence that turns on a particular one of said circuits while essentially simultaneously turning off circuits adjacent thereto.

23. (previously presented) The invention of claim 20 wherein said probe energizes all of said photodetection circuits concurrently but energizes said VCSELs in a sequence that reduces said cross-talk.

24. (previously presented) The invention of claim 23 wherein said probe energizes said VCSELs in a sequence that turns on a particular one of said VCSELs while concurrently turning off VCSELs adjacent thereto.

25. (previously presented) The invention of claim 20 wherein said probe energizes first groups of said VCSELs in said first sequence and second groups of said circuitry in said second sequence, with VCSELs in each of said first groups being energized concurrently with one another and circuits in each of said second groups being energized concurrently with one another.